Claims:

What is claimed is:

1. A surface-spintronic spin conducting device, characterized in that it comprises a solid surface, a magnetic atom thin film layered on a surface of the solid crystal, and electrodes mounted at two locations on said magnetic atom thin film, whereby a spin splitting surface electronic state band formed in a system comprising said solid crystal surface and said magnetic atom thin film is utilized to cause a spin current to flow.

2. A surface-spintronic spin conducting device as set forth in claim 1, characterized in that said solid surface is a nonmagnetic solid surface having a surface projected bulk band gaps and said magnetic atom thin layer is a magnetic atom thin film having a thickness of one to several atom layers.

3. A surface-spintronic spin conducting device as set forth in claim 2, characterized in that said nonmagnetic crystal surface is a copper (111) surface and said magnetic atom thin film is an iron atom thin film.

4. A surface-spintronic spin conducting device as set forth in claim 2, characterized in that said nonmagnetic crystal surface is a covalent crystal surface so treated that it is terminated with hydrogen and said magnetic atom thin film is an iron atom thin film.

5. A surface-spintronic spin switching device, characterized in that it comprises a solid crystal surface, a magnetic atom thin film layered on a surface of the solid crystal, electrodes disposed at two locations on said magnetic atom thin film, and a control means for controlling the direction of magnetization in said magnetic atom thin film, whereby controlling, by said control means, the spin state of a spin splitting surface electronic state band formed in a system comprising said solid crystal surface and said magnetic atom thin film

causes switching on and off a spin current of either a flow of electrons of up spin or a flow of electrons of down spin, of electrons supplied through one of said electrodes from an external spin conducting device.

6. A surface-spintronic spin switching device as set forth in claim 5, characterized in that said solid surface is a surface of a nonmagnetic crystal having a surface projected bulk band gaps and said magnetic atom thin film is a magnetic atom thin film having a thickness of one to several atom layers.

7. A surface-spintronic spin switching device as set forth in claim 6, characterized in that said nonmagnetic crystal surface is a copper (111) surface and said magnetic atom thin film is an iron atom thin film.

8. A surface-spintronic spin switching device as set forth in claim 6, characterized in that said nonmagnetic crystal surface is a covalent crystal surface so treated that it is terminated with hydrogen and said magnetic atom thin film is an iron atom thin film.

9. A surface-spintronic spin switching device as set forth in claim 5, characterized in that it has a control means including a conducting wire disposed laterally adjacent to said magnetic atom thin film and a means for passing an electric current through said conductor to generate around it a magnetic field that is utilized to change the direction of magnetization in said magnetic atom thin film.

10. A surface-spintronic spin switching device as set forth in claim 5, characterized in that said means for controlling the direction of magnetization in said magnetic atom thin film includes:

an up spin and a down spin sources disposed laterally adjacent to said magnetic atom thin film;

a connection member connecting said up spin source to said

magnetic atom thin film;

a connection member connecting said down spin source to said magnetic atom thin film;

a power supply for injecting spins of said up spin source and spins of said down spin source into said magnetic atom thin film, and further a means for applying a voltage from said power supply so as to inject spins of said up spin or down spin sources into said magnetic atom thin film, thereby switching its magnetization into a normal or reverse polarity direction.

11. A surface-spintronic spin switching device as set forth in claim 10, characterized in that said up spin and down spin sources comprise ferromagnetic metals magnetized downwards and upwards, respectively, and each of said connection members comprises a nonmagnetic metal.

12. A surface-spintronic spin memory device, characterized in that it comprises a solid surface, a magnetic atom thin film layered on a surface of the solid crystal, electrodes disposed at two locations on said magnetic atom thin film, and a control means for controlling the direction of magnetization in said magnetic atom thin film, whereby controlling, by said control means, the spin state of a spin splitting surface electronic state band formed in a system comprising said solid surface and said magnetic atom thin film causes switching on and off a spin current of either a flow of electrons of up spin or a flow of electrons of down spin, of electrons supplied through one of said electrodes from an external spin conducting device, and wherein said magnetic atom thin film has a magnetization holding property that is utilized to store information.

13. A surface-spintronic spin memory device as set forth in claim 12, characterized in that said solid crystal surface is a surface of a nonmagnetic crystal having a surface projected bulk band gaps, and said magnetic atom thin film is a magnetic atom thin film having a thickness of one to several atom layers.

14. A surface-spintronic spin memory device as set forth in claim 13, characterized in that said nonmagnetic crystal surface is a copper (111) surface and said magnetic atom thin film is an iron atom thin film.

15. A surface-spintronic spin memory device as set forth in claim 13, characterized in that said nonmagnetic crystal surface is a covalent crystal surface so treated that it is terminated with hydrogen and said magnetic atom thin film is an iron atom thin film.

16. A surface-spintronic spin memory device as set forth in claim 12, characterized in that it has a control means including a conducting wire disposed laterally adjacent to said magnetic thin film and a means for passing an electric current through said conductor to generate around it a magnetic field that is utilized to change the direction of magnetization in said magnetic atom thin film.

17. A surface-spintronic spin memory device as set forth in claim 12, characterized in that said control means for controlling the direction of magnetization in said magnetic atom thin film includes:

an up spin and a down spin sources disposed laterally adjacent to said magnetic atom thin film;

a connection member connecting said up spin source to said magnetic atom thin film;

a connection member connecting said down spin source to said magnetic atom thin film;

a power supply for injecting spins of said up spin source and spins of said down spin source into said magnetic atom thin film, and further a means for applying a voltage from said power supply so as to inject spins of said up spin or down spin source into said magnetic atom thin film, thereby switching its magnetization into a normal or reverse polarity direction.

18. A surface-spintronic spin memory device as set forth in

claim 17, characterized in that said up spin and down spin sources comprise ferromagnetic metals magnetized downwards and upwards, respectively, and each of said connection members comprises a nonmagnetic metal.